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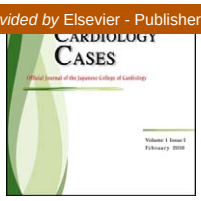

Case Report

Resolution of thrombus in left ventricular outflow tract pseudoaneurysm mimicking periaortic abscess

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KEYWORDS
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Summary Prosthetic valve complications are not uncommon after valve replacement. In this paper we report a female patient who presented with aortic prosthetic valve endocarditis and echocardiographic appearance of periaortic abscess. After 6 weeks of antibiotic therapy, echocardiographic examination revealed resolution of abscess cavity and replacement with a clear blood-filled anechoic sac. Diagnosis was made by cardiac computed tomography, which showed a left ventricular outflow tract (LVOT) pseudoaneurysm rather than an abscess, located just below the sewing ring of the prosthetic aortic valve. We assumed that either resolution of thrombus in LVOT pseudoaneurysm following effective warfarin therapy or clearance of infective content in pseudoaneurysm after co-administered antibiotics gave rise to change in echocardiographic characteristics in the perivalvular area.

Introduction

Aortic valve replacement is the ultimate treatment for severe aortic valve diseases. On the other hand complications such as thrombus and pannus formation [1], valve dysfunction, suture dehiscence (paravalvular leakage) [2], infective endocarditis (IE), and left ventricular outflow tract (LVOT) pseudoaneurysm [3] may cause severe problems to patients and they are great obstacles for the clinicians treating those patients. In this case report we present a female patient with prosthetic aortic valve endocarditis and echocardiographic appearance of periaortic abscess. After 6 weeks of antibiotic therapy, control echocardiographic examination revealed resolution of abscess cavity and replacement with a clear blood-filled anechoic sac. Cardiac computed tomography (CT) showed the continuity of the sac with left ventricular cavity, which suggested that previous perivalvular thickening was actually a LVOT pseudoaneurysm filled with either thrombus or infective-necrotic content which resolved after therapy.

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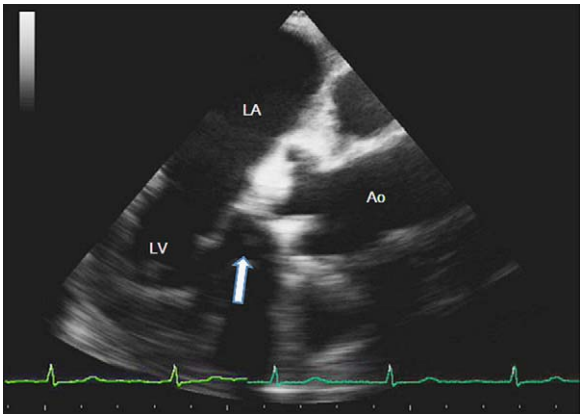

Figure 1 Transesophageal aortic valve long-axis view. Arrow points to a small vegetation attached to the ventricular side of the prosthetic aortic valve. Ao, aorta; LA, left atrium; LV, left ventricle.

Case report

A 55-year-old woman with prosthetic aortic valve was admitted to our hospital because of fever and fatigue that started 3 days previously. In the clinical history, she underwent aortic valve prosthesis implantation 1 year previously due to critical aortic stenosis and since then she was asymptomatic. Ten days before admission, her warfarin treatment was stopped and replaced with low molecular heparin by her local physician because of a dental operation.

On admission, she was febrile (38.5 °C) and her heart rate and blood pressure were 95/bpm and 130/65 mm Hg, respectively. Cardiac auscultation revealed a grade 2/6 systolic murmur at right cardiac base and a grade 2/6 diastolic murmur at left sternal border. No other abnormalities were reported. Regarding the patient's clinical history, diagnosis of infective endocarditis was considered. Routine biochemical tests and blood cultures were ordered and a transthoracic echocardiography (TTE) was planned. Therapy with empiric antibiotics were started immediately. Laboratory investigations showed a white blood cell count of 15,000/mm^3, anemia with a hemoglobin level of 9.3 g/dL, and a C-reactive protein level of 15 mg/L (normal value <5 mg/L). The electrocardiogram (ECG) was unremarkable. The international normalized ratio (INR) of prothrombin time was 1.2. Two-dimensional TTE demonstrated a small mobile mass attached to the ventricular side of the prosthetic aortic valve. In order to demonstrate the mass more clearly, transesophageal examination (TEE) was performed. In addition to the mobile mass, TEE revealed a heterogeneous hyperechoic perivalvular thickening that might be consistent with periaortic abscess formation (Figs. 1 and 2a, Video S1, Video S2). Blood cultures were positive for *Streptococcus viridans*. Diagnosis of prosthetic valve endocarditis with periaortic abscess was considered. The patient's situation was discussed with a cardiovascular surgeon and early reoperation was recommended. As the patient refused surgery, supportive medical care with specific antimicrobial therapy was continued thereafter. In the first 10 days, the patient became afebrile and leucocyte counts tended to decrease. Her clinical situation went well and medical treatment was extended to 42 days.

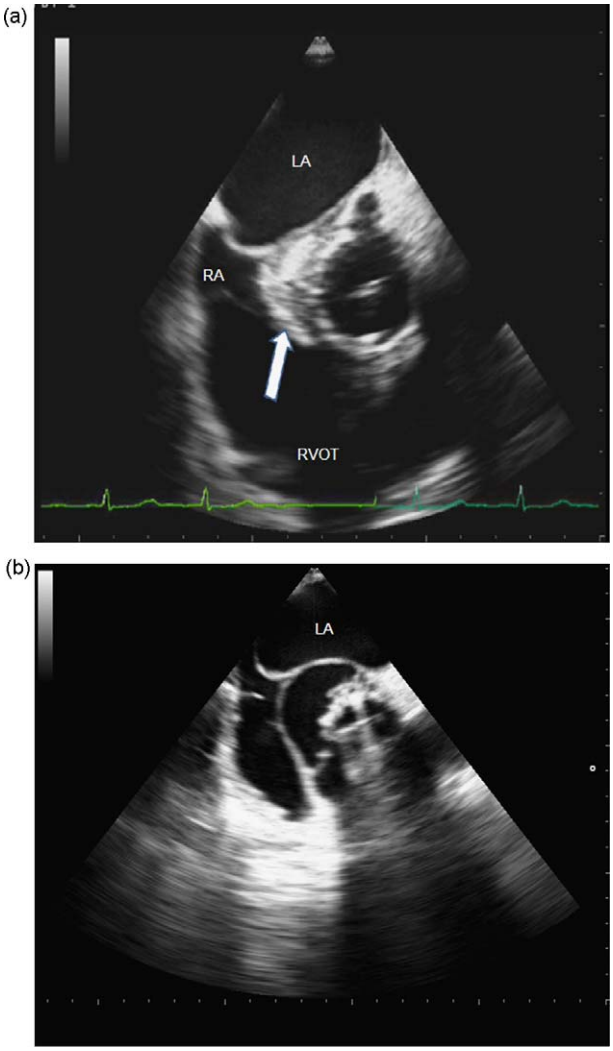

Figure 2 (a) Transesophageal short-axis view of the prosthetic aortic valve. Note periaortic heterogeneous hyperechoic thickening (arrow), which was initially considered as periaortic abscess. (b) Transesophageal short-axis view of the prosthetic aortic valve after 6 weeks of antimicrobial therapy. Former hyperechoic area around the prosthetic valve is replaced by a clear blood-filled sac. LA, left atrium; RA, right atrium. RVOT, right ventricular outflow tract.

Before discharge, TEE examination was repeated. The former hyperechoic area around the prosthetic valve and mobile vegetation were found to have totally disappeared and instead a pulsatile periaortic anechoic sac was observed (Fig. 2b, Video S3). Cardiac CT examination was performed to better evaluate the perivalvular area. Cardiac CT demonstrated a LVOT pseudoaneurysm located just below the sewing ring of the prosthetic aortic valve rather than a perivalvular abscess (Fig. 3).

Before discharge surgical reconsultation was obtained. The patient was advised to undergo surgery of the LVOT pseudoaneurysm with replacement of prosthetic valve with aortic homograft. The patient refused surgery again and medical contact was lost thereafter.

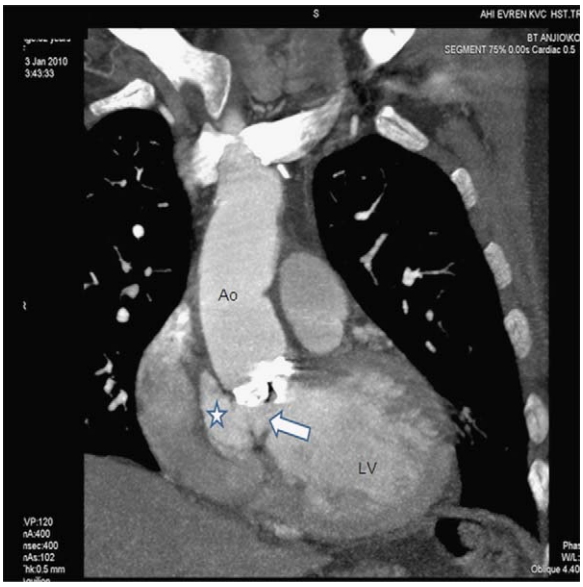

Figure 3 Cardiac multidetector computed tomography (coronal image) shows pseudoaneurysm (asterisk) of left ventricular outflow tract. Note the pseudoaneurysm opens to the left ventricular outflow tract with a narrow neck (arrow). Ao, aorta; LV, left ventricle.

Discussion

Pseudoaneurysm is a common postoperative disorder after prosthetic aortic valve replacement. However, only a few investigators have reported the condition [4]. TTE has long been considered as the first-line method for the evaluation of prosthetic valve function. However, it has some diagnostic insufficiencies related to ultrasound physics such as acoustic shadowing and limited acoustic window and spatial resolution. Those technical shortcomings, in the presence of vague symptoms, might explain the sparse reporting of pseudoaneurysm in the medical literature [5].

The development of pseudoaneurysms after aortic valve replacement is attributed to suturing technique [3,5]. When a tight suture tears the LVOT wall, the high velocity blood flow in the LVOT enters the tear and forms a pseudoaneurysm. If the tearing is severe, suture dehiscence and paravalvular leakage can occur. In addition, a few cases of LVOT pseudoaneurysm due to endocarditis have been reported [6,7]. In those cases, aortic valve endocarditis is usually the main reason that predisposes the mitral-aortic intervalvular fibrosa to perforate and form a pseudoaneurysm. The relatively avascular tissue of this region contributes to extension of the infection.

In the absence of endocarditis as a cause, patients with LVOT pseudoaneurysm may remain asymptomatic. However, serious complications due to LVOT pseudoaneurysm may develop such as tamponade caused by rupture into the pericardium, thrombosis of pseudoaneurysm with or without peripheral embolization, destruction of aortic or mitral valve apparatus with severe valvular dysfunction, or IE [6]. A few cases of angina have also been reported due to external compression of coronary arteries [8]. It is, therefore, important to recognize this complication early, and to institute appropriate surgical treatment in a timely fashion in order to decrease the morbidity and mortality related to LVOT pseudoaneurysm.

In our case we assumed that bacteremia after dental operation resulted in prosthetic valve endocarditis. At the time of the first echocardiography, perivalvular thickening around the prosthetic aortic valve was thought to result from the extension of aortic valve endocarditis and formation of abscess. After 6 weeks of antibiotic therapy, we observed that previous heterogeneous periaortic thickening, consistent with perivalvular abscess, was completely cleared and replaced with an anechoic sac. It is probable that the decrease in the bacterial load and associated inflammatory process might have resulted in change in echocardiographic characteristics of the perivalvular area. El-Chami et al. reported a similar case of IE with an aortic root abscess in a patient's aortic valve replacement [9]. In their case, a large aortic root abscess was observed on TEE, and the patient was diagnosed with IE due to methicillin-resistant *Staphylococcus aureus* infection. After successful antibiotic therapy, a repeat TEE revealed enlargement of the abscess and clearance of the contents within the abscess space. Although, perivalvular extension of IE might sufficiently explain the condition of our patient, the cardiac CT images obtained after 6 weeks of antibiotic therapy have let us consider an alternative explanation. The cardiac CT revealed LVOT pseudoaneurysm with continuity to left ventricular cavity through a narrow neck. We assumed that IE resulted in a patient with previously asymptomatic LVOT pseudoaneurysm that formed long before the index hospitalization as a complication of aortic valve replacement. The discontinuation of warfarin therapy while the patient was prepared for dental operation might have resulted in thrombosis of LVOT pseudoaneurysm. The perivalvular hyperechoic thickening that was observed on the first TEE, might actually be a thrombosed pseudoaneursym, rather than a perivalvular extension of infection, which resolved after achieving optimal INR level during the hospital course. Although the perivalvular extension of infection cannot be excluded by any imaging modality without biopsy at time of surgery, the clinical course with good response to antibiotic therapy and visualization of pseudoaneurysm by cardiac CT examination have let us consider the latter explanation more likely. The echocardiographic clue that favors the latter scenario is the observation of the systolic expansion and diastolic collapse of the perivalvular sac, which clearly demonstrates anatomical continuity of the sac with left ventricular cavity. It should also be kept in mind that fistula formation of perivalvular abscess into the left ventricular cavity and formation of LVOT pseudoaneurysm is also possible.

Evolving modern noninvasive imaging modalities such as multidetector CT (MDCT) can help clinicians manage difficult clinical situations related to prosthetic heart valves. The high spatial resolution of MDCT can clearly reveal the details of paravalvular structures without hindrance from acoustic shadowing or the limited acoustic window and spatial resolution of echocardiography. Tsai and colleagues proposed MDCT to be superior to echocardiography in the detection of LVOT pseudoaneurysms in patients who have undergone aortic valve replacement with prosthetic valves [5]. Despite growing experience on the use of real-time three-dimensional echocardiography in various cardiac conditions, there are no published data on the use of three-dimensional

TEE (3-D TEE) in the evaluation of LVOT pseudoaneurysm. However, high spatial resolution of 3-D TEE and its potential for delineating the three-dimensional anatomic relationship of desired structure renders this novel technique as an attractive alternative imaging method. In addition, contrast echocardiography during TEE could provide additional information such as continuity of perivalvular sac to left ventricle. We suggest that such imaging modalities can be used as a complementary tool to conventional TTE for the evaluation of periprosthetic valvular pathologies.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.jccase.2010.05.009.

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